handled with robustness and tolerance. On the well-worn themes of realism and romanticism Mr. Perry succeeds not only in giving a clear exposition of the main lines of previous debate, but, especially in the case of the former, in making a distinct contribution to criticism. The question of form brings up also the question of the value of training to the novelist, and the main discussion closes with essays on "The Short Story" and "Present Tendencies of American Fiction." An appendix contains bibliographies, lists of topics for study, questions on selected masterpieces, and problems for original work in construction and analysis.

From this outline it will be apparent how skilfully the author has combined the stimulus of an æsthetic discussion with the practical devices of a text-book. By the nature of his task he has been compelled to restate and reargue much that is familiar, but which the teacher dare not take for granted, and at the same time he has been constantly led to treat the standing problems of the theory of art. One misses an explicit discussion of the general purpose which all good fiction aims to serve. Again and again the argument leads up to it, and those familiar with the problems involved will be able to infer Mr. Perry's view. But to the present writer it seems that an early chapter laying down clearly the relation of fiction to life would give the student for whom the book is primarily intended a firmer footing in the subsequent discussions, and would supply a criterion that is elsewhere but vaguely indicated. Yet, as a whole, the volume is surprisingly adequate, clear in exposition, and in judgment admirably sane.

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SOME RECENT TEXTS ON PHYSICS.

Elements of Physics. By FERNANDO SANFORD. New York: Henry Holt & Co., 1902. Pp. 426, 12mo.

Physics: A Text-Book for Secondary Schools. By FREDERICK SLATE. New York: Macmillan, 1902. Pp. 414, 12mo.

Laboratory Exercises in Physics. By GEORGE R. TWISS. New York: Macmillan, 1902. Pp. 193, 12mo.

Elements of Physics. By AMOS T. FISHER AND MELVIN J. PATTERSON. Boston: Heath, 1902. Pp. 180, 12mo.

Introduction to Physical Science. By ALFRED P. GAGE. Revised edition. Boston: Ginn, 1902. Pp. 359, 12mo.

A COMPARISON of the texts enumerated above furnishes material for considerable thought and leads to a recognition that the methods of teaching physics are in a state of rapid change. The first two of the works mentioned are written from a new standpoint — one which is in marked and interesting contrast to that taken by the writers of physics texts in the past. It is interesting to note that the first publications in which a decided change in the conceptions of the place of physics in the schools and its value as a subject of study are manifested should come from the far West; for Mr. Sanford is professor of physics at Leland Stanford Junior University, and Mr. Slate is located at the University of California.

The new point of view can perhaps be best stated in the words of Mr. Sanford; for we read in his preface: "The new method of acquiring knowledge, which may be

called the scientific method, has been often discussed, and there is substantial agreement as to the steps which it involves. They are: (1) the acquisition of individual facts, either by general observation or by the method of artificial observation known as experimentation; (2) generalization, the statement of a general relation which seems to exist between these individual facts; (3) deduction, the making of individual inferences based upon the generalization of the second step; and (4) experimentation to test the accuracy of these inferences. A method which starts in the middle of the process by stating the generalization and requiring the pupil to make the deductions only, may give a good training in deductive reasoning — in algebra and geometry — but it cannot teach physics. A method which makes the generalizations and deductions and calls upon the pupil to verify these deductions by experiment, likewise gives training in but one step of the process. And a method which teaches the subject-matter of physics from the text-book alone and provides a list of unrelated experiments to be performed for the purpose of training the observing powers or of giving skill in manipulation misses the whole process. The present text-book is the result of an attempt of the writer to apply this scientific method in all its steps to the teaching of physics."

Such an attempt is worthy of the highest praise. It marks a new epoch in physics teaching, because it is characterized by the desire to look at the work in physics from the standpoint of the pupil — to realize very clearly and definitely exactly what good the student can get from the course. In teaching by the older method we have been looking at the instruction from the point of view of the specialist who must know the abstract formulations of the laws of the science. But the vast majority of the pupils of the high school will not be physicists, and so we may fairly ask whether, under the older system, they get enough that is valuable from the work in physics to repay them for the time and energy which they are compelled to expend upon it. But if the subject is taught as Mr. Sanford proposes to do it, then every student must get some skill in thinking by the scientific method; and this skill involves the development of power of observation, power of imagination, reasoning power, and a state of open-mindedness. Are not these characteristics which are of inestimable value to everyone, whether he is to be a scientist or not? And, therefore, will not every student acquire from a pursuit of physics in this way something which will be always valuable to him?

So we congratulate Mr. Sanford for having given us something definite to work upon. We urge every teacher of physics to add this book to his library and study its method and spirit carefully. We go farther, and ask everyone to try the method in his classes and see if it does not lead to greater interest on the part of the pupils and a greater efficiency of the work in developing human power in them, and thus of justifying the presence of physics in the curriculum. For, after all, when we look closely to it, it is not to teach the so-called laws of physics that we physics teachers are employed; it is only in so far as we develop human power in our students that we justify our existence, the teaching of the laws of physics being of very secondary importance.

The new method of presentation involves a change in the usual order of the subjects, a change which seems to be clearly an advantage, as it places the difficult portions later in the course where they belong. If there are points which we can criticise without having used the book in actual work, we would object to the introduction on the first page of the time-worn but useless definitions of the science of physics, and especially of matter and energy. To tell a student that matter is the "indestructible substance of all bodies which are appreciable to our senses" is to involve him in the

scholastic metaphysics of the Middle Ages. We would prefer to leave these things undefined at first. We would also suggest an even greater use of the history of the subject — not a filling in with dates and names, but a tracing of the ideas which were held at various times as to the inner nature of the phenomena under consideration. These criticisms are unimportant, however, when compared with the great advance in method which the book advocates.

If it were my good fortune to have to present our subject to a class of beginners, I would adopt this book as the text in preference to all others. I believe it to mark a decided advance toward the true attitude toward the teaching of physics, and hence I would use it and endeavor to adapt it to the circumstances in which I happened to be placed.

The book by Mr. Slate is also written from a very similar point of view. It has given me much pleasure to read it, but I cannot help but see that a younger mind might not follow the rather involved reasoning. It will certainly prove to be very valuable to those of us who wish to hasten the introduction of the newer ideas into the teaching of the science which we love. We are glad to note the absence of scholastic definitions at the beginning of the work. We, however, look in vain for an explanation of the working of the steam engine, in which we believe every boy is keenly interested. We are merely told that the steam engine is an example of the conversion of energy in the form of heat into mechanical energy, and then a reference is given to the encyclopædia article on the steam engine for further information. Comparing this book with Mr. Sanford's, we see that it is much more theoretical and discusses ideas more fully, while it is less practical and definite. The two books are thus good complements to one another.

Both of the texts which have just been discussed contain both expositions of theory and descriptions of experiments. The little manual by Mr. Twiss is for laboratory use only. The purposes in view in the experiments are stated as: "First, to secure the thorough enforcement of some of the fundamental principles of the science together with a view of the kind of experimentation by means of which the facts and principles of physics have been established; second, to develop habits of precision in observation, thought, and expression; and, third, to train the student in the acquisition of practical power and skill in the use of apparatus." It will be noted that the purposes contain implicitly the method advocated in this review. The method of presentation of the matter is clear and brief, and the book contains many valuable hints as to neat management of the laboratory work. It is a compact and useful treatise and deserves a place in the laboratory of every secondary school. The apparatus called for is not extensive, yet well devised to illustrate the principles under discussion. The subordination of manipulation to thought-processes is to be highly commended.

Having taken the position that in the proper presentation of physics the scientific method of thought should be forced upon the attention continually, we cannot sympathize with the presentation of the subject contained in the text by Messrs. Fisher and Patterson. The book begins with an attempt at a definition of matter, thus: "Every object that has extension or that can affect our senses directly or indirectly is called matter." According to this, sound and light waves would be matter. We are then informed that "extension is that property or quality of matter by virtue of which it occupies space or takes up room." On p. 3 we are introduced to the theory of the constitution of matter, namely, that it consists of molecules, etc. Definitions of

volume as the amount of space that a body occupies, and of mass as the quantity of matter that a body contains, are then introduced. These are followed by definitions of porosity, elasticity, impenetrability, indestructibility. The next chapter continues the determination of the properties of things about us without experiments by defining hardness, tenacity, ductility, malleability, and momentum. After a brief discussion of abstract motion and force, we are introduced to Newton's laws of motion because they "fully explain the effect of force in producing a change in the condition of rest or of motion of bodies." On p. 11 the diagram illustrating the capillarity of mercury is incorrect, the mercury having momentarily forgotten itself and risen in a capillary tube above its level in the outer vessel.

The subject of heat is introduced as follows: "The molecules of which a body is composed are believed to be in a state of more or less rapid motion. The velocity of the molecules of a body increases as its temperature rises; when the velocity of the molecules decreases, the temperature falls." Since the book thus fails to realize the method of presentation which we prefer, we can only recommend it to those who like the other method, for, as Lincoln used to say, "For those who like that sort of a thing, that's the sort of thing they like."

The *Introduction to Physical Science* of Mr. Gage is too well known to need description. The new edition has been embellished with photographs of some of the leaders in science. While we recognize cordially the important use which Mr. Gage's books have performed in introducing laboratory work into schools, we find ourselves not altogether in sympathy with the method of presentation. In presenting electricity he begins with an experiment, while the first thing we learn in light is the fact that there are two widely different theories as to the nature of light and that we have to believe in an ether which fills all space, etc. Of course, we prefer the treatment given the electricity.

As we remarked at the outset, these five new texts form an interesting subject of study. The first two are the product of the far West, and in them the idea of teaching so that method of thinking is the first purpose is openly avowed. Mr. Twiss, who works in Cleveland, has also adopted, though perhaps less openly, the newer method. And, finally, the two books from Boston still cling to the older idea of using physics for the egotistic purpose of teaching its own laws only.

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A Short History of Germany. By ERNEST F. HENDERSON. Vol. I, pp. viii + 517; Vol. II, pp. 471. New York: The Macmillan Co., 1902.

THE author of this work is a practiced hand in historical writing and therefore needs no introduction to the public. He disarms criticism by calling his work "short," somewhat of a misnomer for a two-volumed history, and in his preface he does some special pleading for his points of view. In these days of specialization, perspective is more than likely to be lost, which would seem true of the importance our author attaches to the Holy Roman empire. For at least half of the time when it was supposed to be a factor in the destinies of Europe it was but a name, and one of no very good repute. Luther and the Reformation he stood for were of greater importance, but his influence was not so potent in the religious controversies of western Europe as was that of the French reformers, notwithstanding the author's "surely." The influ-